APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/772,924	01/31/2001	Daiki Masumoto	1359.1036	9962

21171 7590 03/18/2004	EXAMINER
STAAS & HALSEY LLP SUITE 700 1201 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005	STREGE, JOHN B

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 03/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

Period for Reply

> A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
> - Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
> - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
> - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
> - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
> Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>31 January 2001</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-14</u> is/are pending in the application.

     4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-14</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>31 January 2001</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

     a)☐ All   b)☒ Some *   c)☐ None of:

         1.☒ Certified copies of the priority documents have been received.

         2.☐ Certified copies of the priority documents have been received in Application No. _____.

         3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

     * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>3</u>.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2.   Claims 1-3, 5-7, and 13-14 are rejected under 35 U.S.C. 102(a) as being

anticipated by IEEE published *From few to many: generative models for recognition*

under variable pose and illumination by Georghiades et al. (hereinafter Georghiades).

Georghiades discloses that image variability due to changes in pose and

illumination can seriously impair object recognition (stated at least in the abstract).

Further disclosed is an appearance based modeling method for recognizing objects

under large variations in pose and position (fourth and fifth paragraph of the

introduction). A database is disclosed for storing registered images of users (at least the

first paragraph of section 4 Recognition Results). The process for finding the similarity

between an input image and the registered image is disclosed in section 4.2

Recognition Under Variable Pose and Illumination. This is done by capturing a plurality

of pictures of different poses and illumination as seen in figure 3.

Regarding claim 2 Georghiades discloses modeling the illumination and pose

using Lambertian reflectance (first paragraph section 2.1).

Regarding claim 3 as seen in figure 2c, a portion of the image is cut out from a picture 2a.

Regarding claims 5-7, Georghiades discloses constructing illumination cones (models based on illumination) and surface cones (models based on pose) to synthesize novel images of an object under differing pose and lighting used in the recognition process (section 2.3 first paragraph). The conditions are modeled separately and then combined to synthesize the image.

Claim 13 is a method claim with the same limitations as the apparatus claim 1. Thus the same argument can be used for the rejection of claim 13.

Claim 14 is a computer-readable medium claim with the same limitations as the apparatus claim 1. Thus the same argument can be used for the rejection of claim 14.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over IEEE published *From few to many: generative models for recognition under variable pose and illumination* by Georghiades et al. (hereinafter Georghiades) in view of Bang et al. USPN 5,715,325 (hereinafter "Bang").

Georghiades does not explicitly disclose selecting a characteristic small region in the object to be a recognition target. However it is well known in the art of facial recognition to take an image of a scene including the person to be recognized and separate face into different regions and using the regions as recognition targets. One example of this is the invention disclosed by Bang. An image of a person to be recognized is taken (as seen in figure 1) and a bounding box is used to localize possible positions of a persons head. If needed a further eye location procedure matching is performed within this box to recognize the person (col. 2 lines 46).

Georghiades and Bang are analogous art because they are from the same field of endeavor of object recognition.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Georghiades and Bang to obtain an invention that selects an region of interest from a face and creates a model based on that information. The motivation for doing so is that it is well known that the features of a person are unique, therefore to speed up the processing only certain characteristic features need be analyzed instead of the entire face. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Georghiades and Bang in order to obtain the invention as specified in claim 4.

Regarding claim 8, Georghiades discloses constructing illumination cones (models based on illumination) and surface cones (models based on pose) to synthesize novel images of an object under differing pose and lighting used in the

recognition process (section 2.3 first paragraph). The conditions are modeled separately

and then combined to synthesize the image.

5.   Claims 1-2, 4, 9-10, 12 and 13-14 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Burns USPN 5,828,769 in view of IEEE published *A Low-*

Dimensional Representation of Human Faces For Arbitrary Lighting Conditions by

Hallinan.

        Claim 1 discloses, " a picture recognition apparatus, comprising: an object

modeling execution part for estimating variations in appearance of an object caused by

variations in a capturing environment and modeling the object; an object model

registering part for previously registering the object model obtained in the object

modeling execution part in a database; a picture information input part for inputting

picture information of an object to be a recognition target; a similarity determining part

for matching the input picture information with the object model previously registered in

the object model registering part, and determining a similarity with respect to the

registered object model; and an object recognizing part for outputting a type of the

object to be a recognition target determined to be most similar among the registered

object model, wherein, in the object modeling execution part, information of a plurality of

pictures captured by changing a relative position and posture of the object with respect

to the fixed picture information input part is input, and variations in appearance of the

object caused by possible variations in a capturing environment are estimated to be

modeled based on the input information of a plurality of pictures."

Burns discloses a system for visual recognition of an object under arbitrary variations of three-dimensional position and orientation (col. 1 lines 17-20). Multiple model images of the object are captured in digital form and stored in a database (col. 3 line 67 continued to col. 4 lines 1-2 further seen in figure 2)(object model registering part). A current image of an object to be recognized is captured in digital form and input into the system (col. 4 lines 8-10 further seen in figure 2)(picture information input part). The current image patches are compared with the model image patches and matches are identified based on the comparison (col. 4 lines 15-18)(similarity determining part). An object pose estimate is identified that corresponds to the largest number of patch matches and this is used to recognize the object (col. 6 lines 1-11 figure 2)(object recognizing part). Furthermore as can be seen in figure 1, in order to make the model the camera captures several images of a moving object. The different poses captured by the camera in figure 1 are further shown in figures 4A-4C and in figure 5. As stated these are used to form an object pose estimate (object modeling execution part). It could be argued that Burns broadly reads on applicant's lines 19-20 since a variation in a pose of an object is a variation in the appearance of the object caused by movement, and furthermore movement is a variation in the capturing environment. Naturally an object appears differently if it is taken from different positions. However, based on the specification it seems that the variations in a capturing environment also refer to a change in illumination so this alternative will also be considered. Burns does not explicitly disclose estimating variations in appearance of an object caused by variations in illumination.

It is well known in the art to estimate illumination variations in the art of object

recognition. Hallinan discloses that a problem exists in object recognition due to

variation in lighting (from the abstract and first paragraph of the introduction). Further

disclosed is a model for object recognition and scene analysis that permits a recognition

system to both estimate lighting conditions given an image and synthesize an image

given the lighting conditions (page 995 last paragraph of col. 1).

Burns and Hallinan are analogous art because they are from the same field of

endeavor of object recognition.

At the time of the invention it would have been obvious to one of ordinary skill in

the art to combine Burns and Hallinan to obtain an object recognition system that

accounts for variations in the environment due to lighting. The motivation for this

combination would be to account for the well known problems that arise with varying

illumination. Therefore it would have been obvious at the time of the invention to

combine Burns and Hallinan to obtain the invention as specified in claim 1.

Claim 2 discloses, "a picture recognition apparatus according to claim 1, wherein

a Lambertian reflection model is assumed as surface characteristics of the object to be

a recognition target." Hallinan explicitly discloses that the model proposed is very

flexible and need not be limited to Lambertian surfaces (page 998, first paragraph of

conclusions). Furthermore Hallinan suggests that the model should vary depending on

the complexity of the surface geometry and bi-directional reflectance function, with

smooth lambertian spheres requiring the fewest eigenfaces (page 998 second

paragraph of second column).

Claim 4 discloses, "a picture recognition apparatus according to claim 1, wherein, in the picture information input part, a characteristic small region in the object to be a recognition target is selected from a picture, and the object to be a recognition target is modeled based on information included in the selected small region and arrangement information of the small region." Burns discloses that image patches are selected from an image and that these patches include information useful in computing a pose estimate for the object (col. 4 lines 1-8).

Claims 9-10, and 12 disclose the same limitation pertinent to different base claims "wherein, in the object modeling execution part, variations in appearance caused by variations in a posture of the object and variations in appearance caused by variations in illumination conditions are modeled together based on the input picture information." As discussed above Burns discloses a system that models variations in posture of the object, and Hallinan discloses a system that models variations in the illumination of the object. These are both well known procedures and since both of the variations are important to being able to recognize an object it would be obvious to combine them as discussed above in order to model both of the conditions together as stated in claims 9-10, and 12.

Claim 13 is a method claim with the same limitations as the apparatus claim 1. Thus the same argument can be used for the rejection of claim 13.

Claim 14 is a computer-readable medium claim with the same limitations as the apparatus claim 1. Thus the same argument can be used for the rejection of claim 14.

6.   Claims 3 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Burns USPN 5,828,769 in view of IEEE published *A Low-Dimensional Representation*

of Human Faces For Arbitrary Lighting Conditions by Hallinan and further in view of

Bang et al. USPN 5,715,325 (hereinafter "Bang").

Claim 3 recites, "A picture recognition apparatus according to claim 1, wherein, in

the picture information input part, a portion including the object to be a recognition target

is cut out from a picture, and the object to be a recognition target is modeled using the

cut out portion."

The combination of Burns and Hallinan does not explicitly disclose cutting out a

portion of a target to be used for recognition. In the disclosure of Hallinan it is stated that

the model is tested on faces, but it does not go into detail as to how the facial

information is found. However it is well known in the art of facial recognition to take an

image of a scene including the person to be recognized and separate the face from the

background information for purposes of recognition. One example of this is the invention

disclosed by Bang. An image of a person to be recognized is taken (as seen in figure 1)

and a bounding box is used to localize possible positions of a persons head. This

bounding box information is analyzed and used to identify the person.

Burns, Hallinan, and Bang are analogous art because they are from the same

field of endeavor of object recognition.

At the time of the invention it would have been obvious to one of ordinary skill in

the art to combine Burns and Hallinan as discussed above and further combine Bang to

obtain an invention that cuts out the facial portion of an image. The motivation for doing

so is that the background of an image is not important for recognition purposes, therefore it would be more efficient to do the processing on just the facial information used to recognize the person. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Burns, Hallinan, and Bang in order to obtain the invention as specified in claim 3.

Regarding claim 11 as discussed above Burns discloses a system that models variations in posture of the object, and Hallinan discloses a system that models variations in the illumination of the object. These are both well known procedures and since both of the variations are important to being able to recognize an object it would be obvious to combine them as discussed above in order to model both of the conditions together as stated in claim 11.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Illumination-based image synthesis: creating novel images of human faces under differing pose and lighting – Georghiades et al.
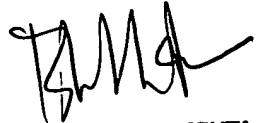
Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached Monday-Friday between the hours of 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number

for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

JS

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